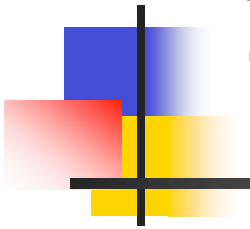


A New Event Display Analysis Tool for MicroBooNE Handscan

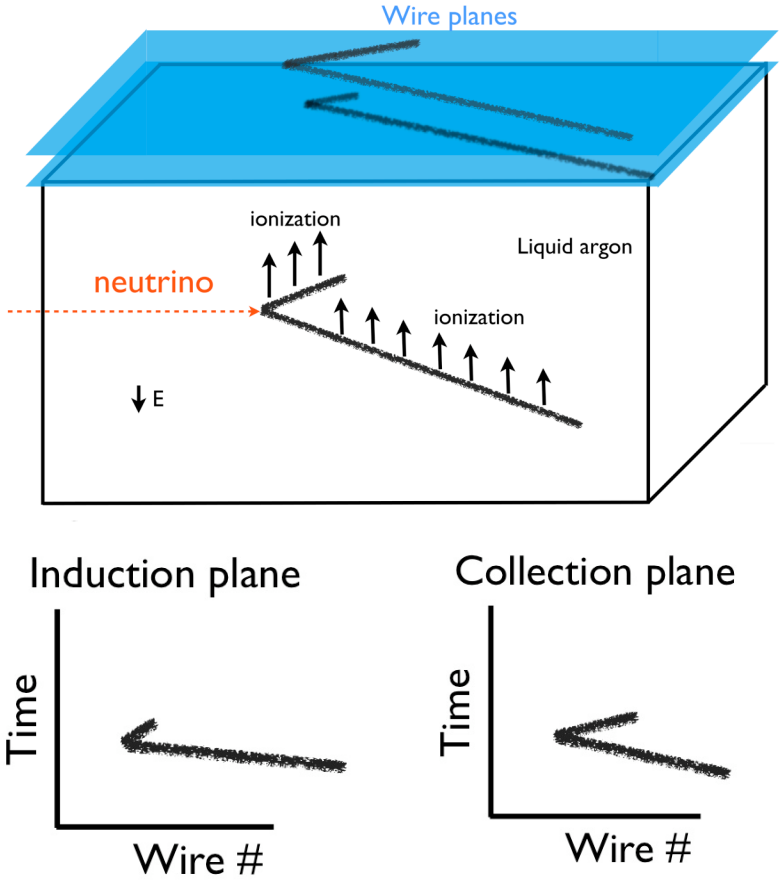
Ellen Klein

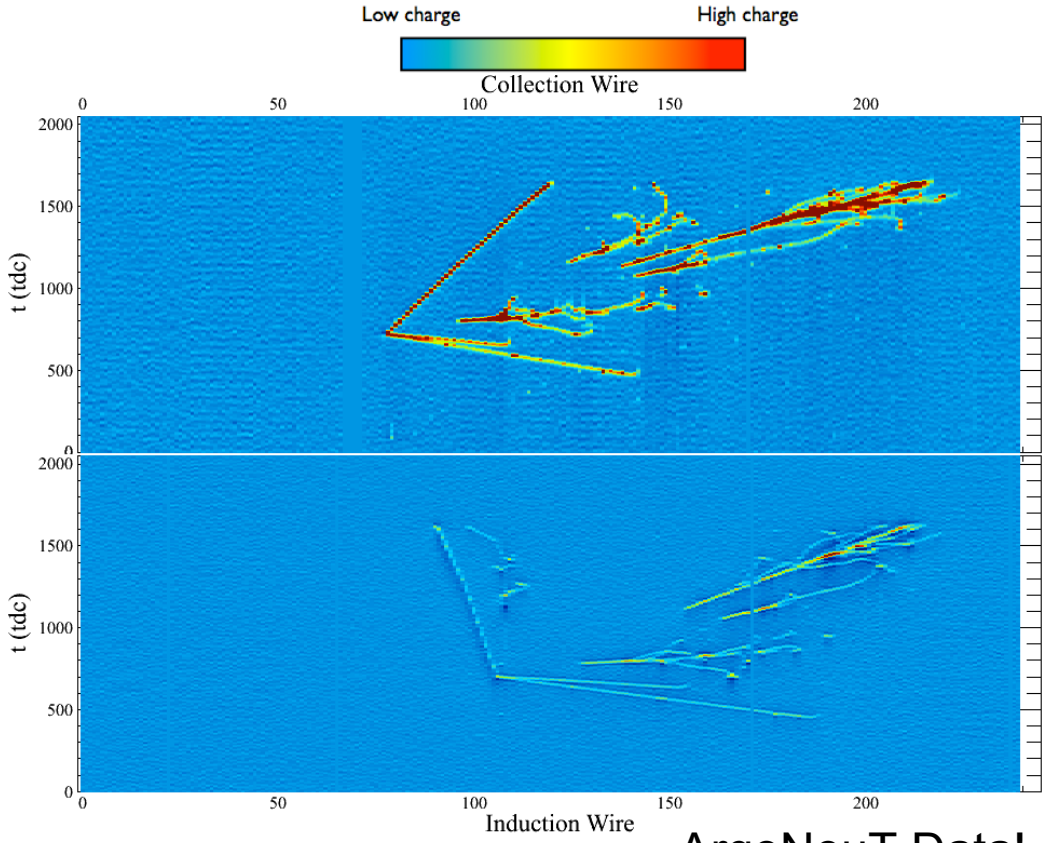
Yale University

MicroBooNE Summer Student Presentations

08/03/12

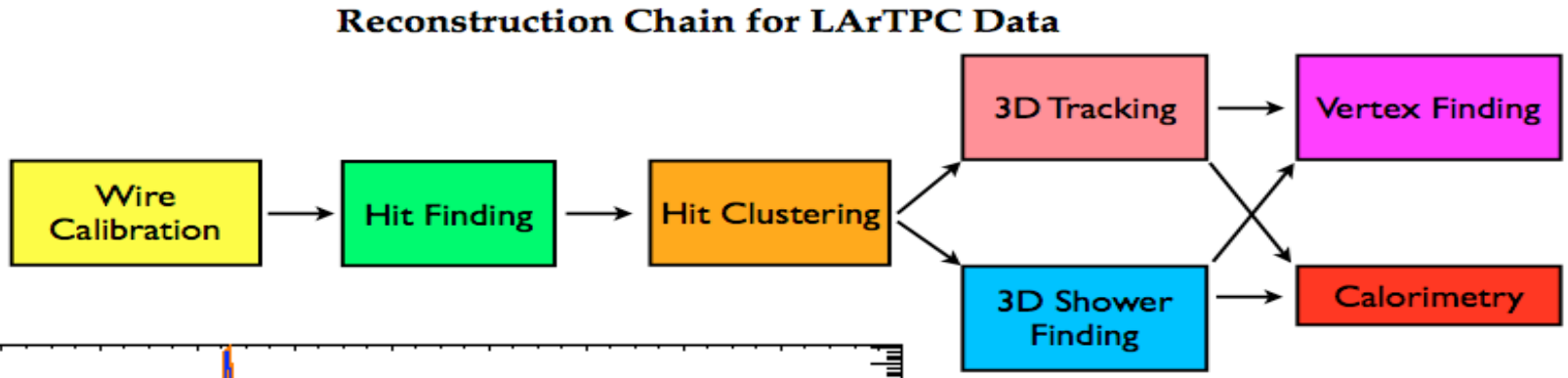
Introduction to TPC

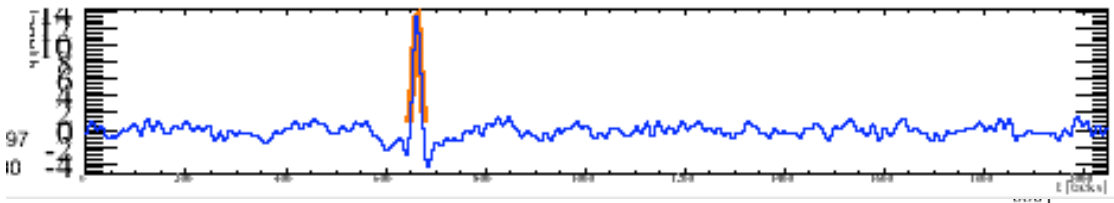




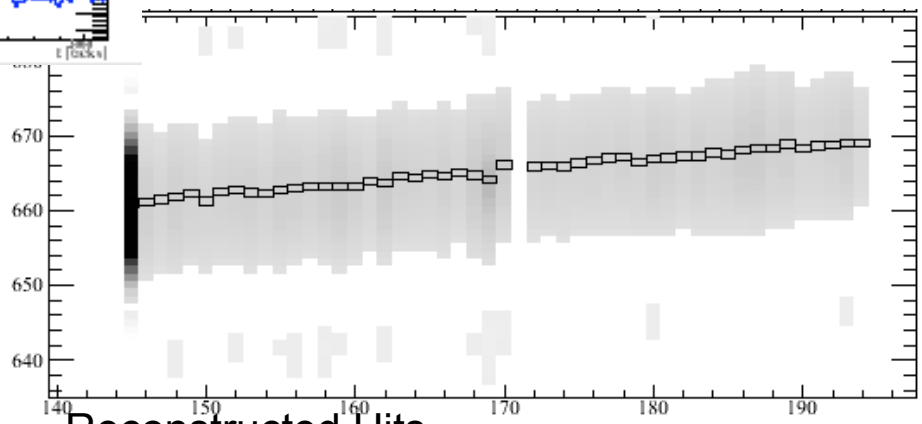
ArgoNeuT Data!

LArSoft Reconstruction

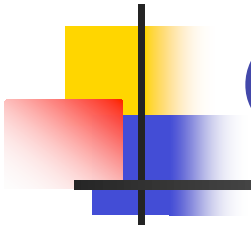




Wire Readout



Reconstructed Hits

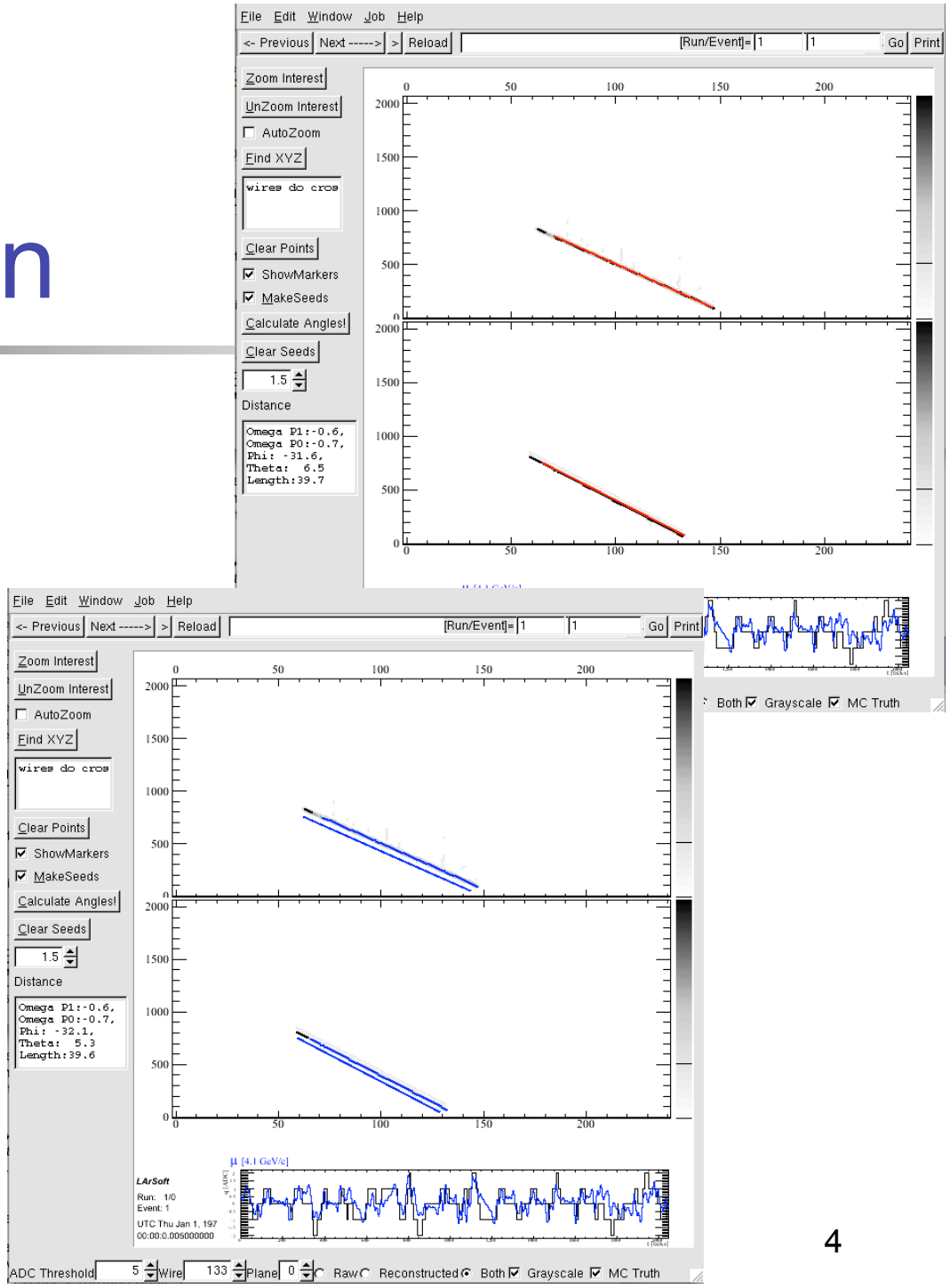


Goal

- Create hand scan tool where evd users can select hits in a cluster (add/remove individual hits), run reconstruction and calorimetry algorithms on clusters, look at calorimetry/PID
- Evd will create clusters, all other reconstruction algorithms should work as is
  - Change fcl parameter so that use evd clusters

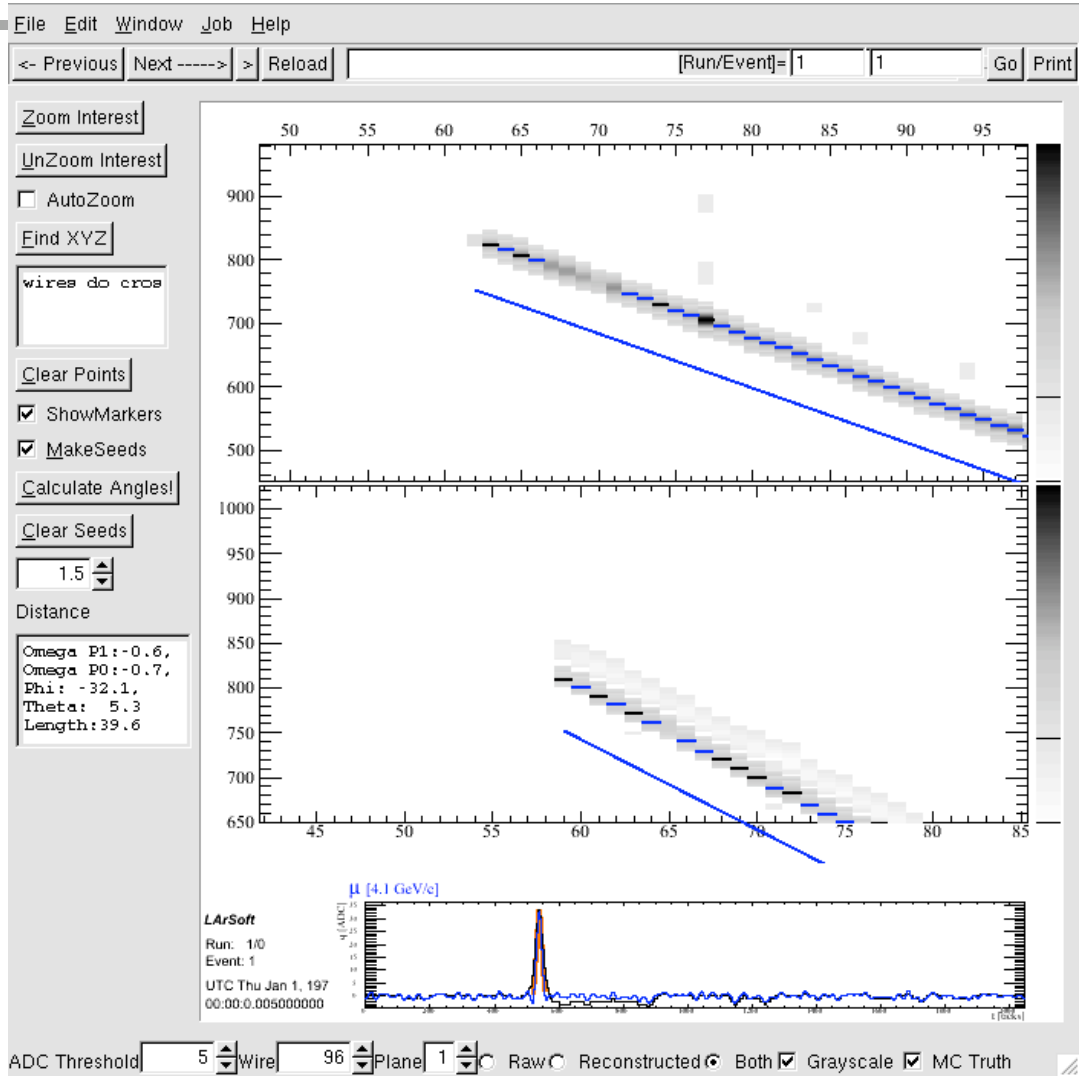
Hit Selection

- Draw lines over particle tracks in evd
  - Direction is important! Keeps track of start and end points
- Evd will select hits within a 1.5 cm box around line, selected hits are blue
- Box width is an option set by user



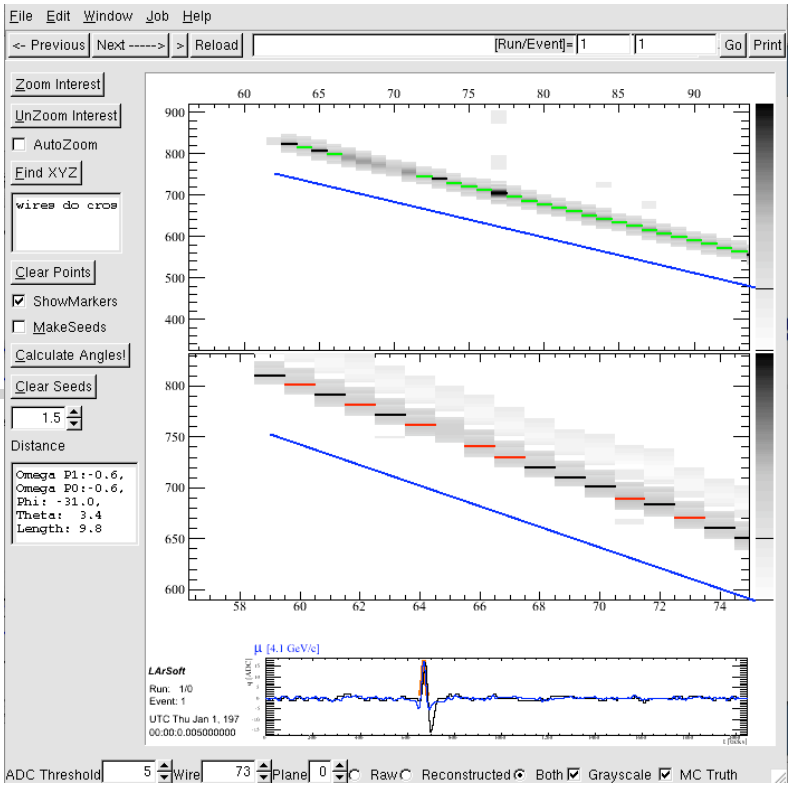
Hit Selection (2)

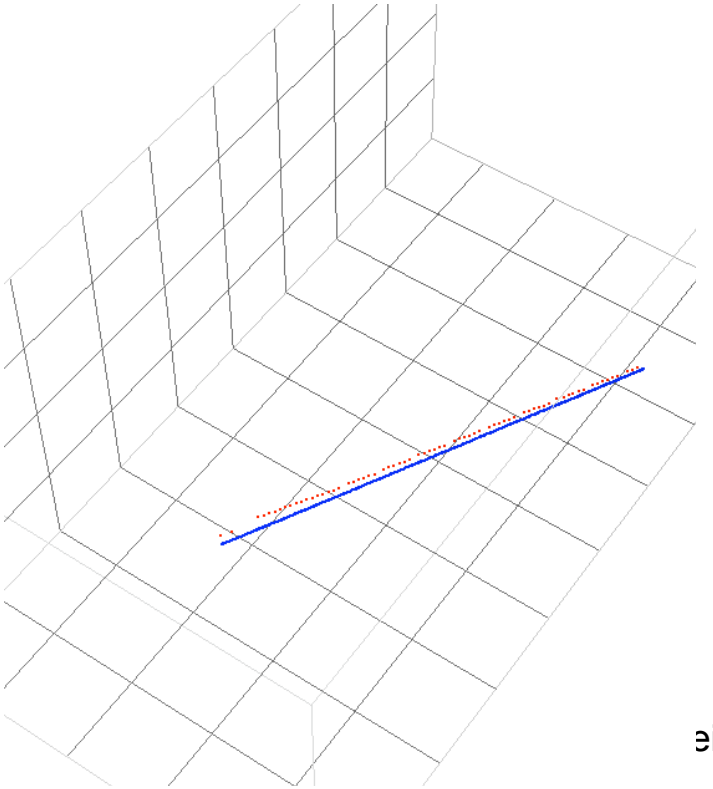
- Shift+click to add or remove hits from the cluster



Reconstruction

- Clicking “Reload” button will pass selected hits to clustering producer



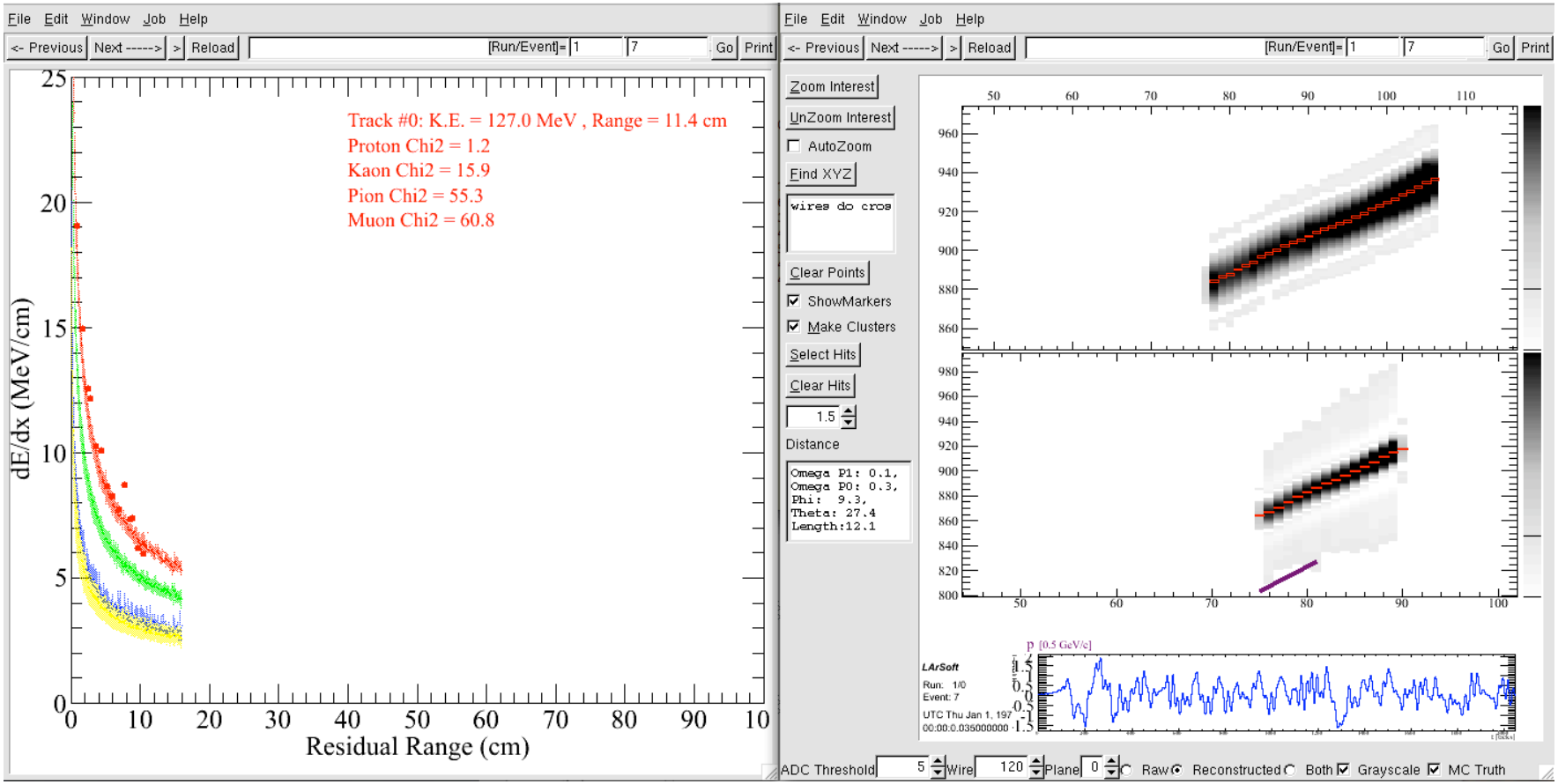


- Can pass these clusters to other reconstruction algorithms: track3Dreco, spacepts, spacepoints, seeds, etc.

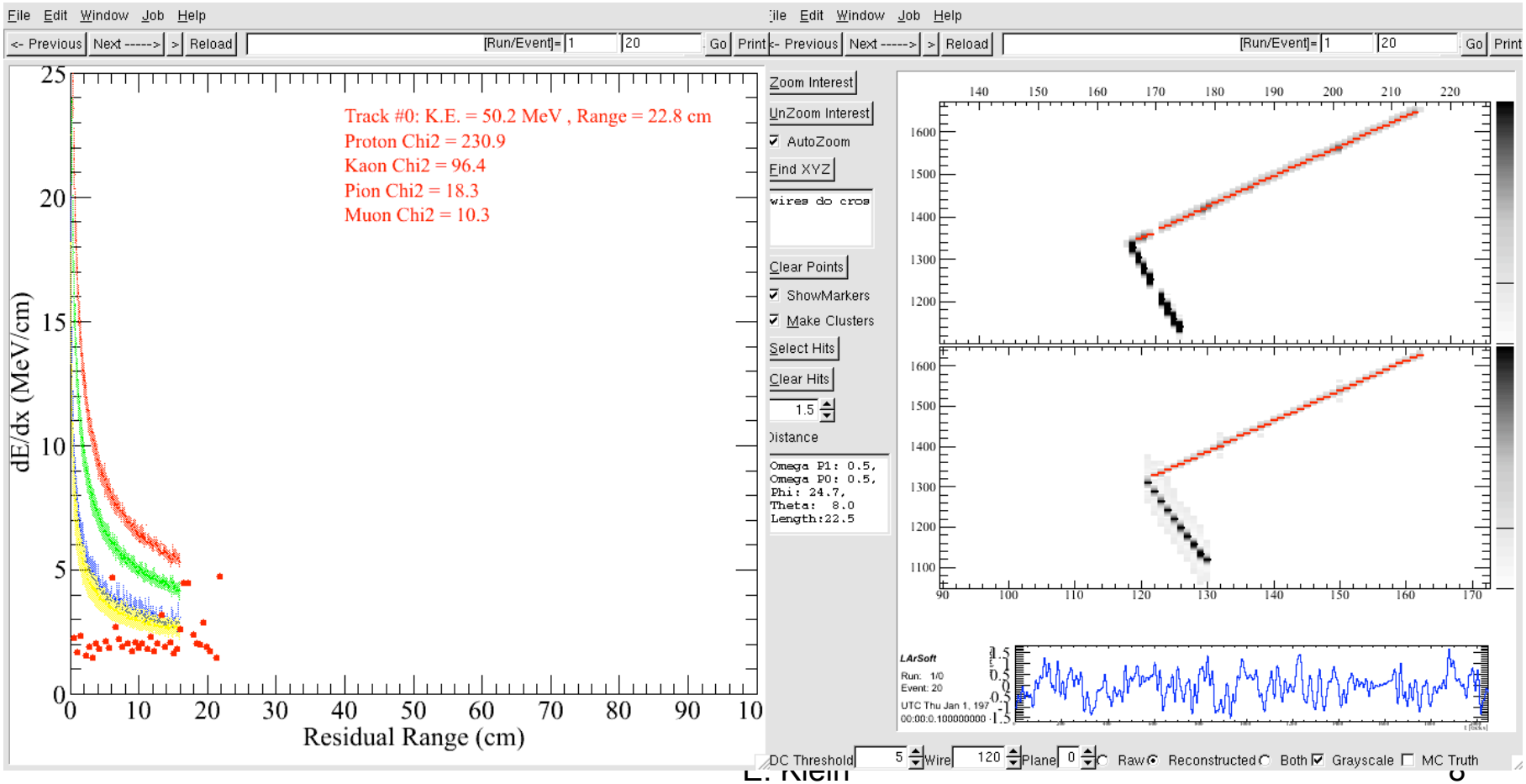
Thanks to Tingjun and Ornella for calorimetry and PID code and Mitch for display

Reconstruction (2)

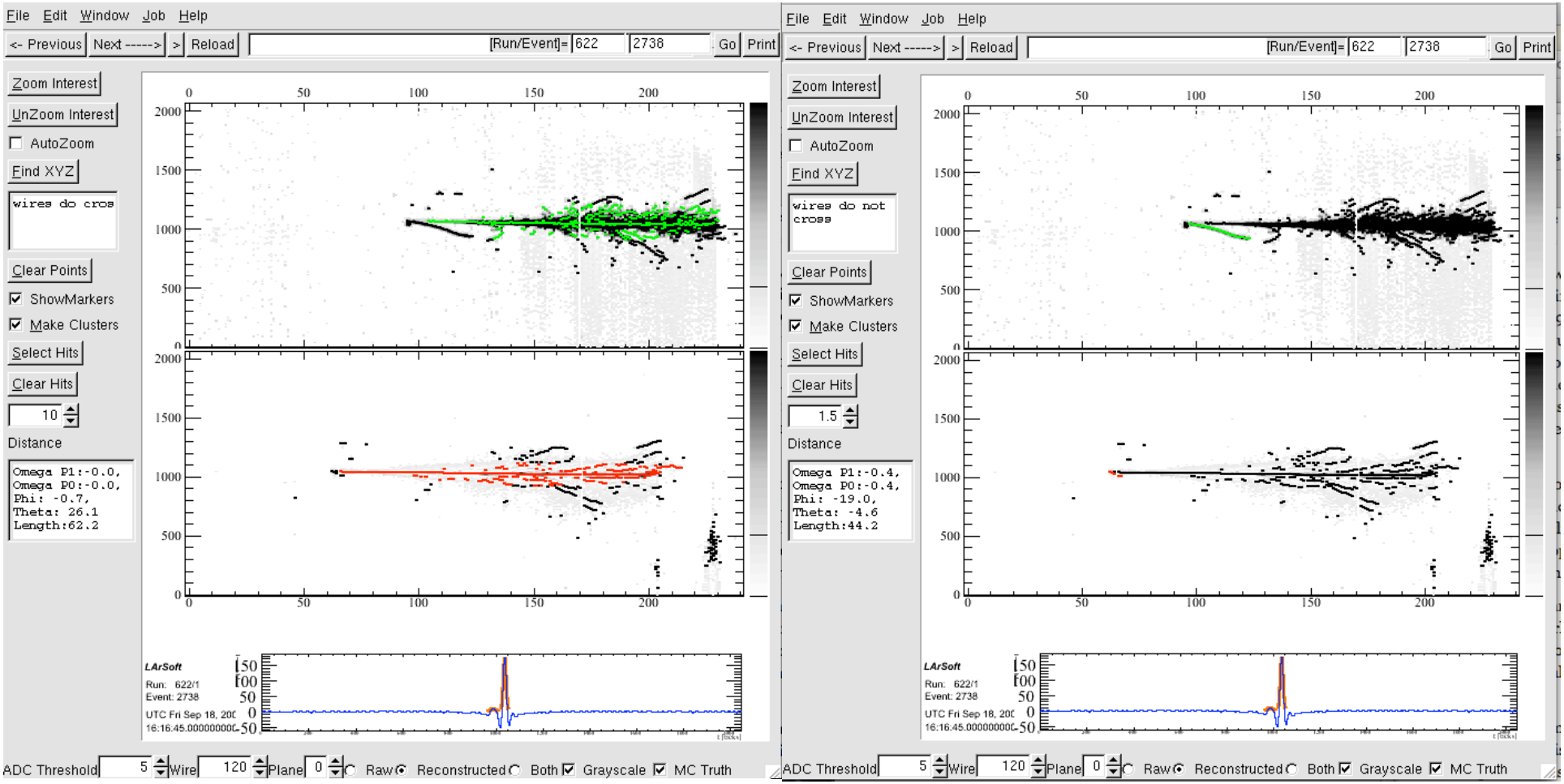
- Can also run calorimetry/PID on clusters from the evd to help determine particle type!



Muon Reconstruction

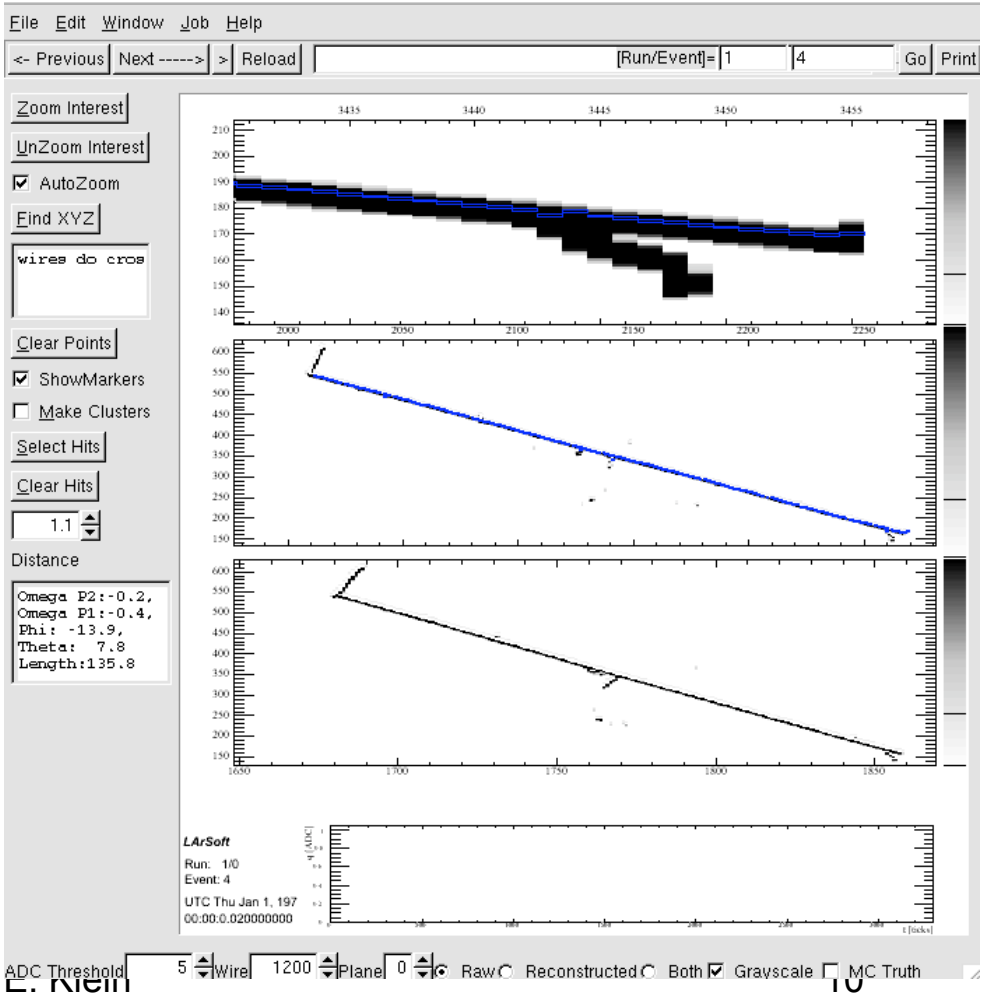


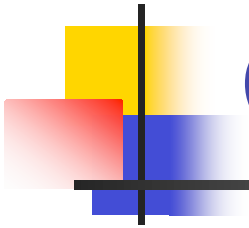
Data


File Edit Window Job Help
<- Previous
Next ----->
Reload
[Run/Event]=
622
2738
Go
Print
Zoom Interest
UnZoom Interest
AutoZoom
Find XYZ
wires do cros
Clear Points
ShowMarkers
Make Clusters
Select Hits
Clear Hits
10
Distance
Omega P1:-0.0,
Omega P0:-0.0,
Phi: -0.7,
Theta: 26.1
Length:62.2
LArSoft
Run: 622/1
Event: 2738
ADC Threshold
5
Wire
120
Plane
0
Raw
Reconstructed
Both
Grayscale
MC Truth
File Edit Window Job Help
wires do not cross
1.5
Omega P1:-0.4,
Omega P0:-0.4,
Phi: -19.0,
Theta: -4.6
Length:44.2

MicroBooNE

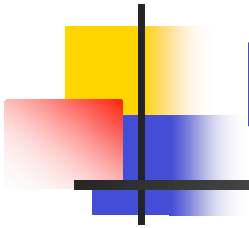
- Works in MicroBooNE geometry too!
- Note clear resolution on delta ray
- Still exploring which tracking algorithms are best
- Plan to use this for MicroBooNE oscillation handscan





Current Status

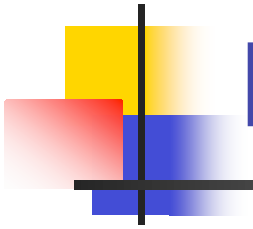
- Fixing one last issue, then will check in the new Event Display code
- Evd creates clusters, all other reconstruction algorithms work without changes
  - Change fcl parameter so that they use evd clusters
- Step by step instructions for use are in backup slides



Next Steps

- Test with other reconstruction algorithms (ie seeds)
- Create multiple tracks per event and save reconstruction to event record (shouldn't matter for hand scan)
- Any other ideas? Let me know! (Ellen.Klein@Yale.edu)

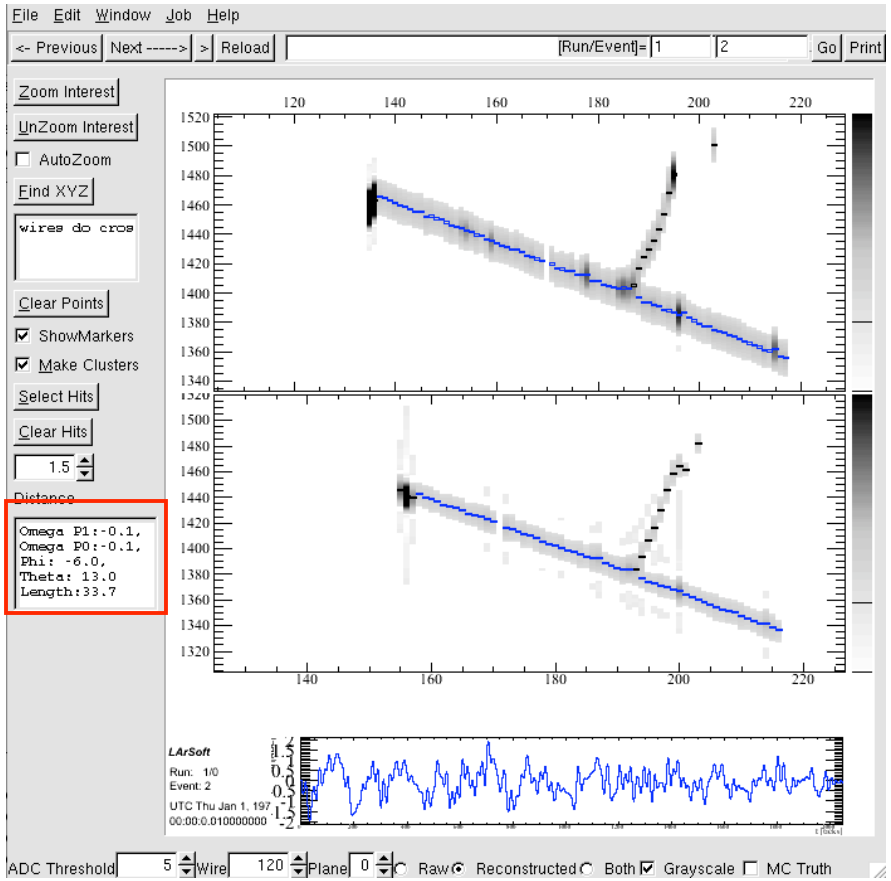
Thank You!



Backup

Extras

- Box on left side of evd will display track parameters (length, phi, theta)
- Information calculated from the two lines that user draws NOT from track reconstruction



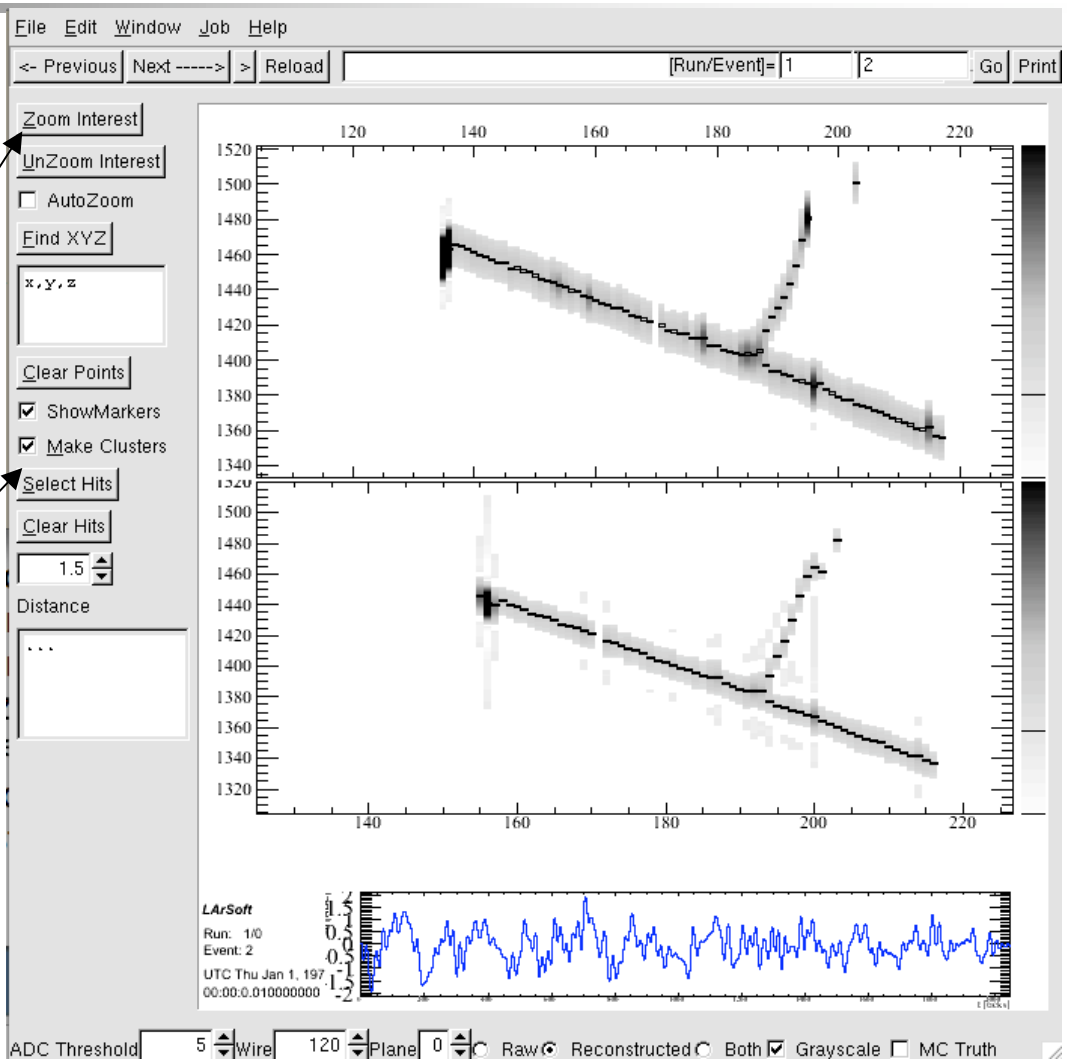
Step by Step (1)

- Decide which reconstruction algorithms you want to run, add these to your evd fcl file as producers
- Make sure they will look for the clusters produced by the evd (graph)

```
physics:
{

 producers:
 {
 graph: @local::argoneut_graphcluster
 spacepts: @local::argoneut_spacepts
 calo: @local::argoneut_calo
 pid:  @local::argoneut_chi2pid
 }

 filters:{}

 analyzers:
 {
  evdisp:{module_type: EVD}
  angles: @local::standard_spacepointana
 }

 #list the modules for this path, order matters, filters reject all following items
 evd: [ evdisp ]
 #recopath: [showeranglecluster, showerfinder]
  recopath: [graph,spacepts, calo ,pid]
  ana: [angles]
 #end_path are things that do not modify art::Event, includes analyzers
 #and output modules. all items here can be run simultaneously
 trigger_paths: [recopath]
 end_paths: [ana,evd]
}

physics.producers.showeranglecluster.ClusterModuleLabel:       "graph"
physics.producers.spacepts.ClusterModuleLabel:                 "graph"
physics.producers.calo.TrackModuleLabel:                       "spacepts"
physics.producers.pid.TrackModuleLabel:                        "spacepts"
```

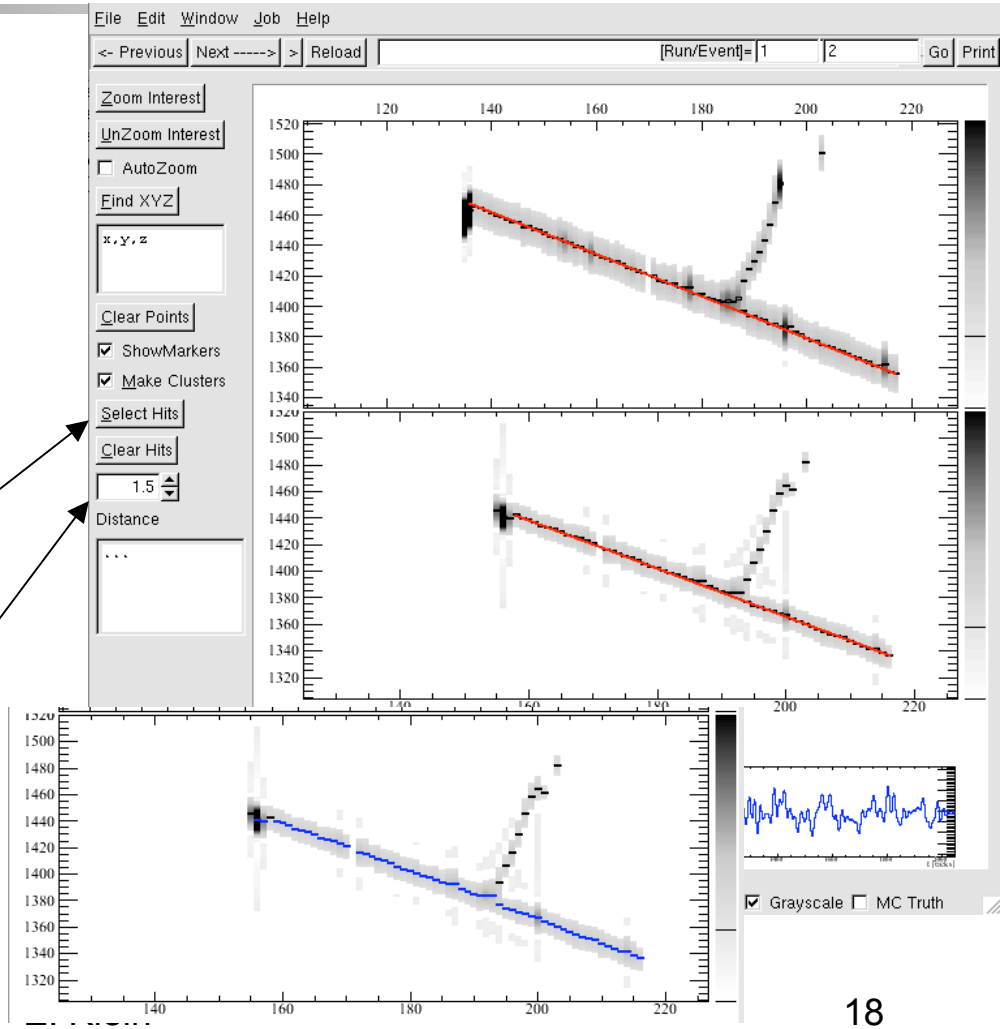
Step by Step (2)

- Run the event display on a file that has reconstructed hits
- Zoom views so that you can clearly see the track you wish to reconstruct
  - “Zoom Interest” is helpful
- Check “Make Clusters”



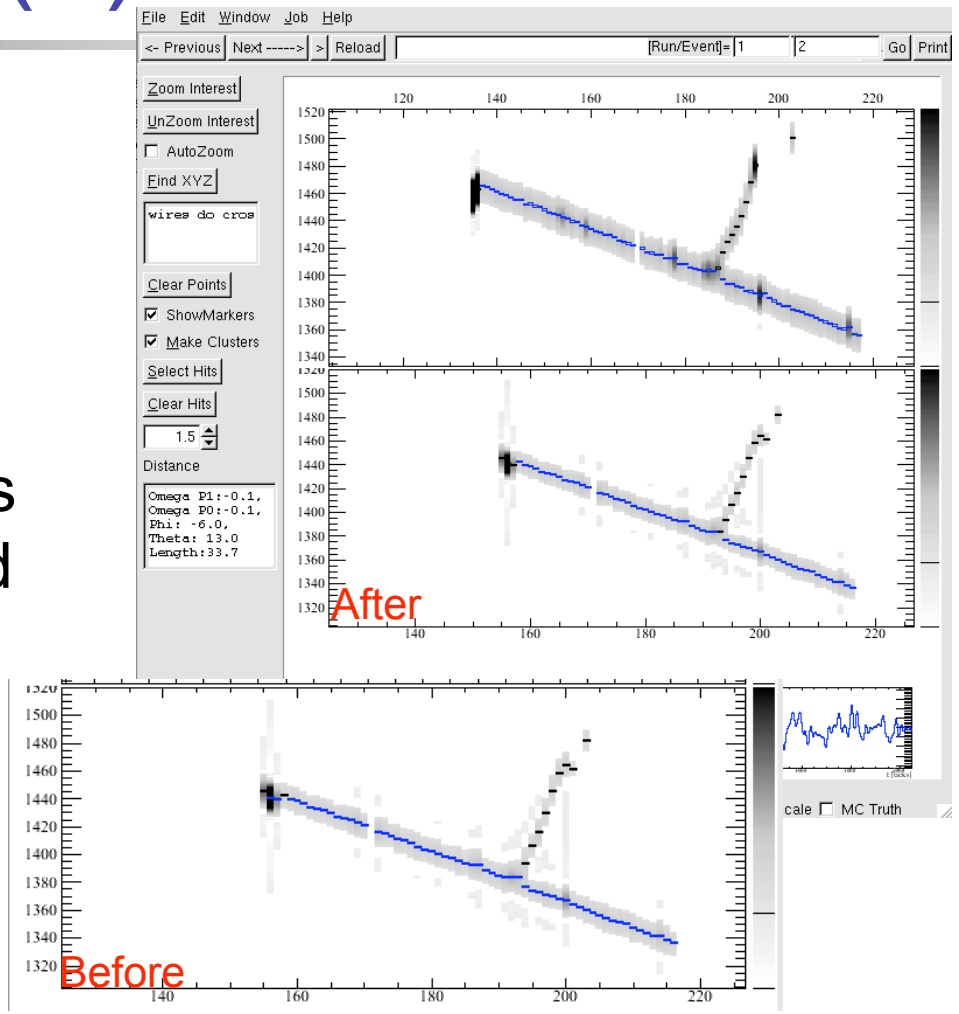
Step by Step (3)

- Click and drag mouse to draw a line over the track you want to reconstruct
  - Click on track vertex, then drag to end of track
- Click “Select Hits” to select hits in a box around the line, selected hits will turn blue
  - Adjust box width
  - Don’t have to redraw line, just click “Select Hits” again



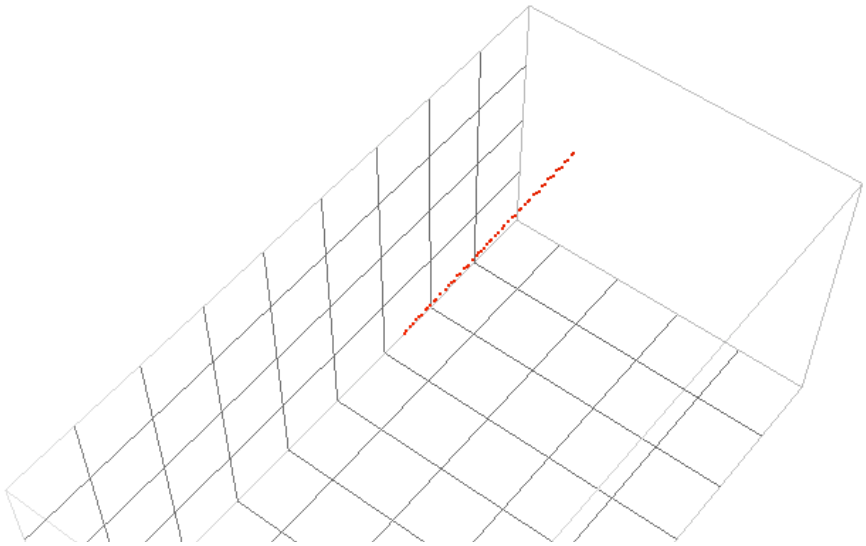
Step by Step (4)

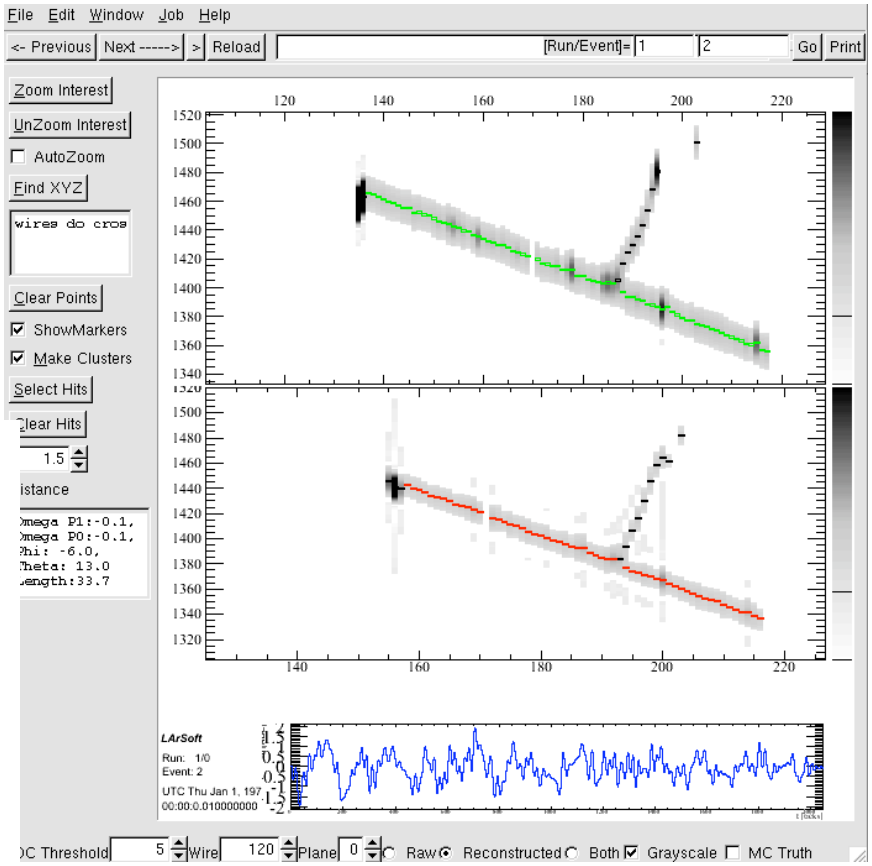
- Shift+click to add/remove individual hits from cluster
  - Useful for overlapping tracks, delta rays, etc.
  - Helpful to zoom in on parts of the track, especially end points!
- “Clear Hits” button will unselect hits in ALL planes



Step by Step (5)

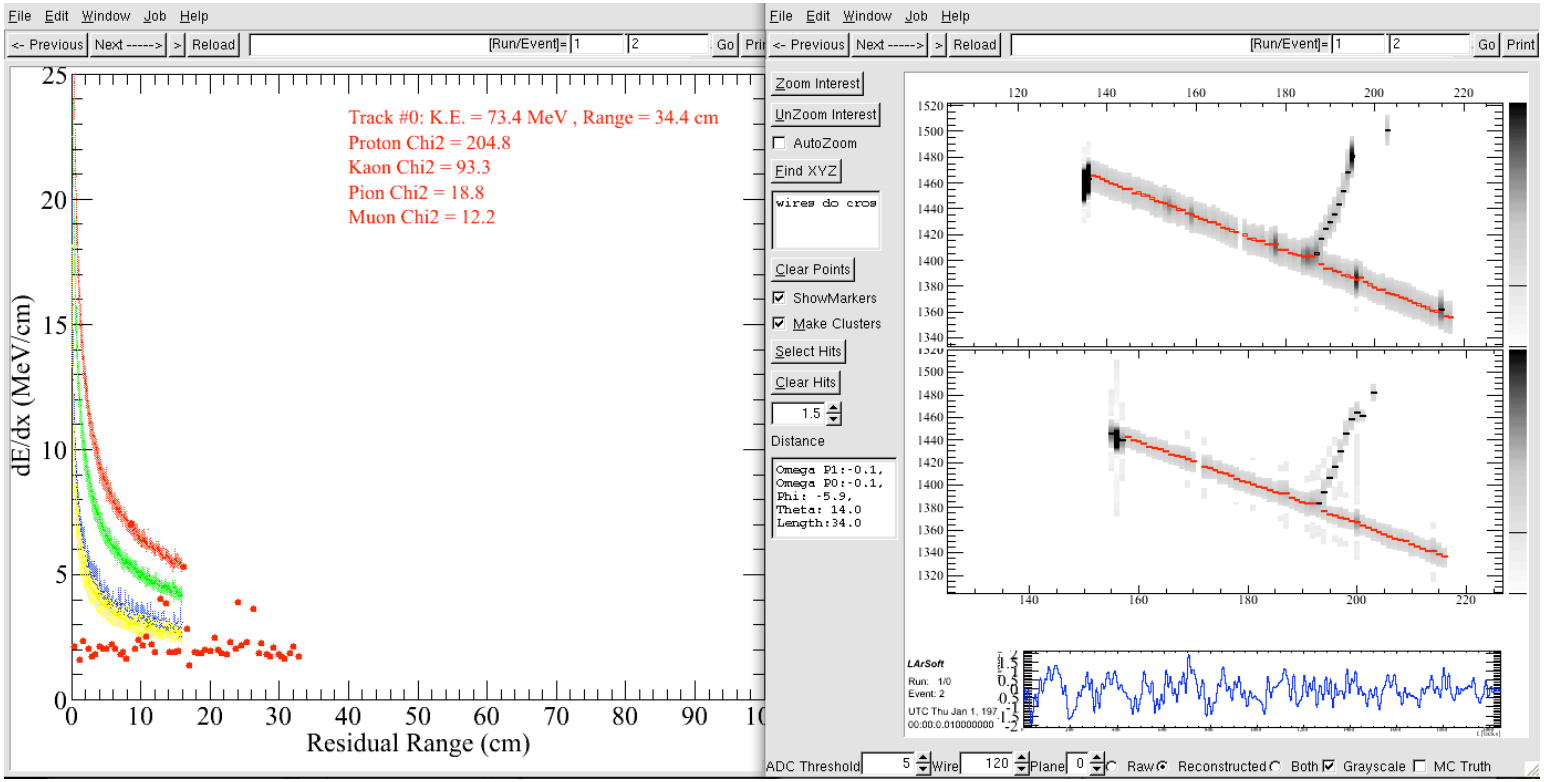
- When satisfied with selected hits, click “Reload” to make clusters and run reconstruction modules





Step by Step (6)

- Mitch added calorimetry window to the event display
- After reloading, click Window->Calorimetry
- Useful to look at particle ID to determine particle/event type



Step by Step (7)

- Click “Next” to clear everything and go to next event in the run
  - Close the calorimetry window first, else will crash! -- will fix this though